SECTION 431

BEACONS AND SPECIAL SIGNAL EQUIPMENT

431.1 GENERAL. This work shall consist of furnishing and installing intersection control and hazard identification beacons and other specialized signal equipment in compliance with the specifications, details shown on the plans, and Standard Drawings at the location shown on the plans, or as established by the ENGINEER.

431.2 REFERENCES.

431.2.1 American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications, Latest Edition

M133 Preservative and Pressure Treatment Process for Timber

431.2.2 American Society for Testing and Materials (ASTM) Standard Specifications, Latest Edition

A123 Zinc Coating on Product Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Stripes

431.2.3 Manual on Uniform Traffic Control Devices (MUTCD), Latest Edition

431.2.4 National Electrical Code (NEC), Latest Edition

431.2.5 National Electric Manufacturers Association (NEMA) Standards, Latest Edition

431.2.6 This Publication, Latest Edition

SECTION 101 PORTLAND CEMENT CONCRETE
SECTION 102 STEEL REINFORCEMENT
SECTION 501 EXCAVATION AND BACKFILL FOR STRUCTURES
SECTION 701 TRENCHING, EXCAVATION, AND BACKFILL

431.3 MATERIALS.

431.3.1 BEACON ASSEMBLY: Beacon assemblies shall be single section, 12" lens, traffic signal assemblies in accordance to the requirements of Section 427 Signal Assemblies. Beacon assemblies shall normally display a flashing red or yellow indication as called for on the plans. Beacons shall be mounted on the specified support (Type I standard, sign support or span wire) as detailed on the plans. The mounting of beacons may be singly or in groups as required.

431.3.2 SPAN WIRE INSTALLATION: Span wire installments shall be a set of poles and guy wire support system over a roadway normally used for flashing beacons and temporary signals. Span wire installations shall include poles, guy wire, clamps, shackles, turnbuckles and all additional material listed on the plans.

431.3.2.1 POLES

431.3.2.1.1 Poles shall be free standing, steel strain poles, or timber poles capable of supporting the span and specified without noticeable bending.

431.3.2.1.1.1 STEEL STRAIN POLES: Strain poles shall be fabricated from round or octagonal, tapered steel tube of a length detailed on the plans and a wall thickness of 3 gauge (approx. 1/4 inch.) or thicker as required by the design span shown on the plans and an AASHTO 80 wind loading. The steel shall have a yield strength of 48,000 psi or greater. All strain poles shall be galvanized inside and out in accordance with ASTM A 123. The length and minimum top and bottom pole outer diameters shall be as called for on the plans.

431.3.2.1.1.2 TIMBER POLES: Timber poles shall be treated in accordance with the "equipments of AASHTO M-133. Poles shall be of the size called for on the plans and as a minimum shall be butt treated.

431.3.2.2 ANCHORS: The anchor base shall be designed to develop the maximum strength of the shaft. Anchor bolts shall be 1 ½" diameter by 5'0" long with minimum tensile strength of 85,000 psi, or as called for on the plans. All anchor bolts shall be provided with two nuts and two washers each.

431.3.2.3 GUY STRAND WIRE: Guy strand wire (7-wire) shall be provided with an approximate weight of 273 lbs. per 1,000 feet and a minimum braking strength of 10,000 lbs.

431.3.3 FLASHER CONTROLLER.

431.3.3.1 FLASHER

431.3.3.1.1 The flasher unit shall be an alternating two-circuit (115 VAC), solid state plug-in type with a 20 amp or greater rating per circuit. The unit shall be designed to plug into a NEMA type.

431.3.3.1.2 All flasher units shall be fully solid state

with no moving parts. The unit shall utilize zero voltage switching with 50 percent on-time and a flash rate of 50 to 60 per minute. All flasher units shall be designed to operate at full capability from -30F to +160F ambient temperature.

431.3.3.2 CABINET.

431.3.3.2.1 The cabinet shall be a sturdy, cast or sheet aluminum housing with a hinged main door equipped with a lock for a police key. Two police keys shall be furnished with each cabinet. The cabinet shall be at least 12 inches by 10 inches by 6 inches deep or as required to house the specified equipment. All switches and controls shall be accessible through the front door.

431.3.3.2.2 The cabinets shall be designed for side-of-pole mounting unless otherwise shown on the plans. Access to the cabinet shall be through a hole located in the bottom and top, drilled and threaded to accept a 1 ½ inch GRC conduit, or as detailed on the plans. All cabinets shall be finished in accordance with Section 429 - Traffic Signal Controllers.

431.3.3.2.3 All cabinet wiring shall be neat and firm. All wiring and harnesses shall be laced or bound together with Ty wrap or equivalent. All terminals shall be numbered and identified in accordance with a cabinet wiring diagram which shall be furnished by the supplier. The flasher cabinet shall include the following terminals, protection devices and switches:

a. Terminal (barrier type) for 115 VAC power feed.

b. Main power supply circuit breaker,, 15 amp. min. rating.

c. Terminals (barrier type) for field conductor to beacons, one for each circuit.

d. Signal shutdown switch, not affecting clock power.

e. Copper ground strip, grounded to cabinet, for connection of all common conductors.

f. Terminal (barrier type) for time switch opening and closing as required.

g. Radio line filter for filtering AC + power.

h. Lighting arrester for filtering lighting or high voltages to ground for protection of equipment.

431.3.3.2.4 When specified, the flasher controller shall include a time switch. The time switch shall be a weekly time clock, programmable for the on/off function at up to eight times a day and 40 times a week. The time clock shall have an available automatic daylight saving time correction. It shall be possible to vary or omit a day program. Programming shall be by keyboard and/or digital switches. Time of day and keyboard entered data shall be shown on an LED display. The clock shall have battery backup so that in the event of loss of AC power, time will be held a minimum of 48 hours at an accuracy of ± 0.005% or better. The time switch shall make it possible to turn the flashing field indications on or off on either a time of day basis or manually. The time clock unit shall be mounted on the back side of door.

431.4 CONSTRUCTION REQUIREMENTS.

431.4.1 Beacons and flasher controllers shall be mounted on the specified support as called for and detailed in the plans.

431.4.2 Installation of span wire poles including anchor bolts shall include the erection of poles as shown on the plans, installation of anchor bolts in a foundation, and leveling the pole. The foundation shall cure for a minimum of 7 days before the pole placement. Grout (4 inches minimum) shall be placed between anchor base and the top of the foundation after raking. The complete span wire shall be tensioned with the sag shown on the plans or as directed by the ENGINEER.

431.4.3 Required electrical cable shall be run inside the pole and extended through the top with standard weatherhead fittings if steel poles are used. Electrical cable shall be run inside galvanized rigid conduit along the outside of the pole if wooden poles are used.

431.4.4 When "temporary signal spans" for use during construction are called and there is not a signal controller available, the CONTRACTOR shall supply a signal controller.

431.4.5 When the plans call for temporary signal spans the CONTRACTOR shall remove the material on completion of the work. Temporary signal spans shall remain the property of the CONTRACTOR after removal unless otherwise specified on the plans.

431.5 MEASUREMENT AND PAYMENT.

431.5.1 Beacons and flasher controllers will be measured by the unit, complete in place.

431.5.2 Span wire installation will be measured by the lump sum including all items listed on the plans or as shown in the Standard Drawings complete in place.

431.5.3 Temporary Signal Spans will be measured by the lump sum including all items listed on the plans or as shown in the Standard Drawings, all adjustment work required during construction phases, and all electrical energy and maintenance costs, complete in place.

431.5.4 The accepted quantities of beacons, flasher controllers, signal spans, and temporary signal spans will be paid for at the contract unit price per unit of measurement for each of the pay items listed as shown on the bid proposal